Remarks

Applicant has reviewed the rejections/objections to claims 1-44 as listed in the office action of paper one. However, Applicant believes the reference of Kraak does not describe the methodology and supporting system framework for manipulation of a temporal domain coupled to a spatial domain as represented by a visualization representation, as presently claimed, further described below.

Further, Applicant presents amended claims 1, 3-6, 8, 9, 12-16, 22, 24, 26, 29 - 32, 34-40, 43, 44, original claims 2, 10, 11, 15, 23, 25, 27, 28, cancelled claims 7, 17-21, 33, 41, 42, and new method claims 45-56 and new system claims 57-80. Applicant notes that the cancelled claim subject matter (other than where explicitly discussed below) has been cancelled to further prosecution of the present application, and therefore the canceling does not constitute any admission of the merit in the Examiner's respective arguments. Accordingly, Applicant reserves the right to present these cancelled claims in a subsequent divisional application as desired.

Applicant will file a certified copy of the priority application upon allowance of the present application. Applicant further will investigate the misunderstanding of the priority date.

Applicant will subsequently supply a timely filed Oath/Declaration to correct the absence of the application number of the priority application.

Applicant supplies a corrected abstract.

Applicant notes the provisional double patenting of original claims 1-44 of the present application in conjunction with copending application number 11/078330. Applicant will address this rejection through submission of a corresponding response to the outstanding office action of the 11/078330 application.

Applicant has cancelled claim 20 rendering the objection moot. Applicant has amended the terms "+" in claims 24 and 26 to now read "and", thus overcoming the objection.

Applicant notes the rejection of claims 1-4, 12-15, 22-31 and 33-44 under 35 USC 102(a) in view of Kraak and has the following response.

Summary of Applicant's Application

Applicant submits that the correct interpretation of Applicant's application is as follows.

As data about events and objects become more commonly available, analyzing and understanding of interrelated temporal and spatial information is increasingly a concern for military commanders, intelligence analysts and business analysts. A system and method is provided for creating a dynamic multidimensional framework for visual representation of a group of data elements having integrated temporal, spatial properties and connectivity. The framework provides an interactive and animated workspace in both temporal and spatial domains, such that updating of displayed visual properties can be facilitated in both domains concurrently. The data elements are included in the visual representation as corresponding visual elements, such that the data elements of the group can linked by at least one association and visually identified via a visual connection element.

The system includes a visualization manager for assembling the group of data elements and for assigning a connection visual element in the visual representation between a first visual element representing a first data element of the group and a second visual element representing a second data element of the group. The system also has a spatial visualization component configured for generating a spatial domain of the visual representation to include a reference surface (either 2D or 3D) for providing a spatial reference frame having at least two spatial dimensions. The reference surface is for relating the first visual

element to a first location of interest in the spatial reference frame and for relating the second visual element to a second location of interest in the spatial reference frame. The system also has a temporal visualization component configured for generating a temporal domain of the visual representation operatively coupled to the spatial domain, the temporal domain for providing a common temporal reference frame for the locations of interest.

An additional dimension is provided as the temporal domain to include a first time track, such as a timeline, coupled to the first location of interest and a second time track coupled to the second location of interest, such that the first visual element is positioned on the first time track and the second visual element is positioned on the second time track. Each of the time tracks are configured for visually representing a respective temporal sequence of a plurality of the data elements (represented by the plurality of corresponding visual elements positioned on the time tracks) at each of the locations of interest of the reference surface, and can extend both above and below the reference surface. The time tracks also each have a respective instant of focus situated at the intersection region between the time track and the reference surface In implementation of the method, the connection visual element represents a distributed association in multiple domains (for example in both spatial and temporal domains) between the first visual element and the second visual element such that the visual representation is displayed on a user interface for subsequent interaction with user events.

Further, Applicant's system and method include using the instant of foci and time tracks extending from the reference surface to facilitate updating of the visual properties of the visual elements in the visual representation, as the positions of the instant of foci on the time tracks are manipulated. The updating of the visual properties of the visual elements include rapid continuous updates which include updates such as but not limited to: removing/adding visual elements on the time tracks; modifying the spatial properties of the visual elements in the spatial domain; modifying the temporal properties of the visual elements in the temporal

domain; repositioning of the visual elements on the time tracks in connection with movement of the instant of focl; and addition/removal of a time track from the visual representation when none of the visual elements contained on the time track are in the time range selected. Updating causes animation of the visual elements in the spatial and temporal domains and is used to help in the analysis of the data contained in the visual representation.

Summary of Kraak reference

In general, Applicant submits that Kraak expands upon the Space-Time Cube of the Hagerstrand's approach. In its basic appearance, the geospatial images consist of a cube with on its base a representation of geography (along the x- and y-axis), while the cube's height represents time (z-axis). It is emphasized that this display is a *static* display of temporal properties once the appropriate geospatial and temporal ranges are selected, as further described below, which is contrary to the present invention as now claimed. A typical Space-Time Cube could contain the space-time paths of for instance individuals or bus routes (see abstract - page 1988). Applicant would like to emphasize that Kraak only discussed space-time *paths*, and as such does not describe nor imply other types of connections between timelines such as activities and events, which is also contrary to the present invention as now claimed. Further, it is recognized that Kraak only described the use of geographic contexts for the space-time cube, and as such diagrammatic contexts are neither described nor hinted, which is also contrary to the present invention as now claimed.

Accordingly, the basic features of the Kraak approach use the space-time cube to follow an individual's daily life as a trajectory through space and time. Two of the cube's axes represent space, and the third axis represents time. This allows the display of trajectories, better known as Space-Time-Paths (STP) - see figure 1.II. The example in Figure 1.I shows Kraak's movements through the city of Enschede on a Thursday. The "vertical lines" indicate a "stay" at the particular location which are called "stations", in Figure 1.I, such as home, pool, work & restaurant. At this observation scale, the stations are equal to no-movement.

The near horizontal lines in the space-time-cube indicate physical travels only (see second paragraph - page 1989), which is also contrary to the present invention as now claimed. Applicant notes that Kraak only describes vertical lines above the geographic plane and is silent on configuration for concurrent visual display of vertical lines below the geographic plane, which is also contrary to the present invention as now claimed. Applicant submits this is an important point to consider as the whole of the Kraak reference only refers to the configuration, display and manipulation of vertical lines on *one side* of the geographic plane. Therefore, any suggestion by the Examiner to the contrary should be regarded as impermissible hindsight in view of Applicant's own description and claims, as further discussed below. Further, in view of Kraak's silence on the matter of vertical lines both above and below the geospatial plane, Applicant further submits that Kraak does not discuss or even imply the configuration and manipulation of a physical instant of focus on the vertical line, used to visually distinguish the past and future time ranges when displayed, as presently claimed, further discussed below.

On further review of Kraak, in manipulation of the space-time cube, a basic interactive visualization environment is described, in which the user can view and manipulate the data of a statically displayed visual representation of the data, as well as to dynamically select a static point of view of the cube. Referenced are options to move slider planes along each of the axes for the *only* purpose of selecting or highlighting a period in time or location in space (to highlight an area of the cube - see second paragraph - page 1992). Applicant submits that Kraak only mentions the use of slider planes to isolate or highlight a range of time or space and gives no explicit teaching of how this functionality is implemented for animation of data in both the temporal and physical domains, which is also contrary to the present invention as now claimed, as further discussed below. The only real example discussed in which the time axis is manipulated is for changing world time for event time (time cartograms) (see abstract - page 1988). For the spatial axes, Kraak describes rotating the cube independently around an axis. Also introduced is a spinning option that allows one to let the cube

automatically rotate around the axis with the purpose to get an overview of the data displayed.

Accordingly, Applicant submits that the Kraak reference *only* refers to standard 3D graphics reproducing camera views by manipulating the viewing angle of three-dimensional cube in space to find the best possible view. Kraak also describes selecting and querying a path segment to view additional details. Users are able to query the Space-Time-Path as shown in figure 3.III. In this example the system responds with an overview of available data on the segment selected. Via the attribute view the user can change the variable attached to the axis or the Space-Time-Path on the fly.

Accordingly, in view of the above Applicant summarizes that Kraak:
a) does discuss a space-time cube;
b) the only objects contemplated in the cube are space-time paths;
c) the only ground plane contemplated is geography;
d) only one time frame (the past) to one side of the geographic plane is taught;
e) the only animation taught is on the base map (see page 1992 - 2nd paragraph "each frame...."). Nothing else animates such that objects only move in geography and certainly no objects are updated in the vertical time dimension; and
f) "querying" the data is a drill-down to provide details of the selected visual element and as such is not a general query.

Examiner's Statements

Further, Applicant respectfully submits that the Examiner's definition of "instant of focus" as supported by Kraak is not in anyway similar to the instant of focus as defined in the below-given claims. For example, the Examiner has equated instant of focus with "cube size" (see discussion in office action with respect to claim 9) and with a "working view" such as a snapshot in time of the entire space-time-cube (see discussion in the office action with respect to claim 3).

Accordingly, Applicant submits that neither the Kraak reference itself, nor the Examiner's interpretation of the Kraak reference, supports any description or inference to an instant of focus configured for positioning on the time tracks in the vicinity of the reference surface such that concurrent past and future ranges of time (and their visual elements) are visually distinguished, as presently claimed. Further, the content of the Kraak reference does not support any simultaneous movement of the instant of foci along the time tracks. Further, Applicant has failed to find any mention in Kraak of the ability to provide time tracks extending and visible above and below the reference surface, as delineated by the instant of focus, which is presently claimed and only supported by the content of Applicant's application.

Conclusion

Applicant submits that Kraak does mention "slider planes" for selection of specific time periods or locations in space, but Kraak does not give any specifics on the implementation of the slider planes nor does Kraak give any description on the display of past, current, future distinctions/viewing with respect to a reference surface. Further, Kraak does not describe or imply the ability to effectively reposition an instant of focus along the temporal scale (i.e. synchronously along all time tracks at once), thus providing for updating of the visual properties of the visual elements on the time tracks, including their respective positions. Further, Kraak does not effectively move (in response to physical repositioning of the instant of foci) event, entity and association visual data elements along the temporal scale, as well as provide for animating via the introduction of new visual elements and animating out the removal of old visual elements as they enter into and leave the displayed time range of the temporal domain. Further, Kraak does not describe the instant of focus and the independent description and specification of past and future time ranges.

Applicant submits that the presently claimed use of the instant of focus, defined as the intersection region between the time tracks and the reference surface, facilitates animation and data analysis using an instant of focus selector of a user

interface, thus including the ability to cycle the reference surface through time showing simultaneous changes in visual elements representing entities, actions, and/or events on the reference surface for the moment in time represented by the instant of focus in a temporal reference frame. This analysis is facilitated through the ability to see temporal context for past and/or future time ranges as selected. Accordingly, manipulation of the visual elements on and/or above/below a spatial reference surface is done via changing of the time instance represented by the instant of focus, as presently claimed. Further, Applicant submits that Kraak does not describe or even infer the use of time tracks extending below the reference surface.

Finally, Applicant would like to direct the Examiner's attention to Figure 4 of Kraak that describes use of an additional video-view to denote changing terrain conditions, operation of which is linked to a "dot" that is statically positioned along the space-time path displayed in the space-time cube. This is a clear indication of the extent of Kraak's teachings, which do not include the animation of visual elements positioned on the time tracks, and on both the reference surface and time tracks as presently claimed. Applicant would like to point out to the Examiner that Kraak's teaching clearly shows that interpretation of Kraak's description must be limited to animation in geography only and that Kraak is therefore silent as to updates of the vertical lines and their displayed contents. Accordingly, it is noted in Kraak that the vertical lines and content and the actual space-time paths are configured for *static* display to the user via the space-time cube, which is contrary to the invention as presently claimed. Further, Applicant would like to reiterate that *static* display of the vertical lines and content and the actual space-time paths teaches away from the need to configure the ability of repositioning of an instant of focus in the direction of either past or future time ranges, as presently claimed.

Applicant further notes the rejection of claims 5-11, 16-21 and 32 under 35 USC 103(a) in view of Kraak. However, in view of the above–noted discussion and claim amendments, Applicant considers this rejection as overcome.

In view of the above, Applicant considers the currently amended claims as allowable and requests reconsideration to that effect. In particular, Applicant strongly believes that Kraak does not describe nor infer a framework to visually distinguish between past and future time events (or actions, entities, associations, or locations) with respect to the reference surface, as well as to facilitate for their update of visual properties through repositioning of an instant of focus as claimed.

The Director is hereby authorized to charge Deposit Account No. 07-1750 in the amount of $1,550.00 for the additional 27 claims with 1 new independent claim (payment of 44 original claims with no independent claims was made at the time of filing) with respect to the above-mentioned application and in the amount of $120.00 for a one month extension of time.

The Examiner is invited to contact the undersigned for any questions on the above.

Respectfully submitted,

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